



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/050,518	01/18/2002	Masaaki Nanaumi	Q68110	7763

7590 02/05/2004

SUGHRUE MION, PLLC  
2100 Pennsylvania Avenue, NW  
Washington, DC 20037-3213

EXAMINER
----------

TSANG FOSTER, SUSY N

ART UNIT	PAPER NUMBER
----------	--------------

1745

DATE MAILED: 02/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/050,518

Applicant(s)

NANAUMI ET AL.

Examiner

Susy N Tsang-Foster

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) 13-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12, 16 and 17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 20020806.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election without traverse of Group I, claims 1-12, 16, and 17 and the sulfonated polyetheretherketone as the species in Paper No. 20031106 is acknowledged.
2. Claims 13-15 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 20031106.

### *Specification*

3. The disclosure is objected to because of the following informalities:

It is unclear to the Examiner what the Q value means since there appears to be contradictions throughout the specification and it is a term not known to one of ordinary skill in the art to characterize a polymer electrolyte membrane or a membrane electrode assembly by a Q value. In paragraph 39 of the specification, applicants states that:

“... the polymer electrolyte membrane should have a Q value (charge per a unit area) of 0.09-0.18 C/cm<sup>2</sup>... Here, the Q value is the amount of electric charge per a unit area determined from a peak area of proton on an adsorption side in the scanning of voltage from -0.1 V to +0.7 V, in a cell in which the amount of platinum in the catalytic layer of each electrode is 0.5 mg/cm<sup>2</sup>, and in which a polymer electrolyte membrane electrode assembly is surrounded by an aqueous sulfuric acid solution of pH 1 on one side and a nitrogen gas on the other side. The Q value may be regarded as an indicator of adhesion of the electrode to

Art Unit: 1745

the polymer electrolyte membrane, and it has been found that with the Q value of 0.09-0.18 C/cm<sup>2</sup>, an excellent polymer electrolyte membrane electrode assembly is obtained. "

As seen in paragraph 39, the Q value limits each of the electrode to have a catalyst loading of 0.5 mg/cm<sup>2</sup> by definition. It also appears to be a contradiction of what the Q value is since it states the polymer electrolyte membrane should have a certain Q value and at the same time the specification also states that the Q value may be regarded as an indicator of adhesion of the electrode to the polymer electrolyte membrane.

Further contradiction of what the value Q means appears to be in paragraph 42 which states:

"the Q value is defined as the amount of electric charge per a unit area of the membrane electrode assembly, indicating that the larger the Q value, the higher the adhesion of the electrode 100 to the polymer electrolyte membrane 101".

It is unclear to the Examiner how the unit area of the membrane electrode assembly is measured in paragraph 42. For example, is it the entire outer surface area of the membrane electrode assembly or the cross-sectional area of the membrane electrode assembly?

Finally paragraph 135 of the specification states that the Q value of each membrane assembly was measured in a range from -0.1 V to +0.7 V.

Art Unit: 1745

Thus, it is unclear to the Examiner how the polymer electrolyte membrane can be characterized by a Q value that appears to be arbitrarily defined by applicant.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 3, 5-11, 16, and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 5, the limitation “said polymer electrolyte membrane having a softening point of 120 °C or more and a Q value of 0.09-0.18 C/cm<sup>2</sup>” is indefinite because it is unclear to the Examiner what the Q value means since there appears to be contradictions throughout the specification and it is a term not known to one of ordinary skill in the art to characterize a polymer electrolyte membrane or a membrane electrode assembly by a Q value for reasons stated in paragraph 3 above.

Furthermore it appears that the Q value claimed is not a property of the polymer electrolyte membrane but the Q value of the membrane electrode assembly that depends on a variety of factors such as the degree of adhesion of the electrode to the polymer electrolyte membrane, concentration of catalyst on the electrode, the degree of ion exchange capacity of the polymer electrolyte membrane, and the operating current density of the membrane electrode

Art Unit: 1745

assembly in the fuel cell. Even if the Q value is claimed for the membrane electrode assembly, the value Q is indefinite because the value varies depending on many factors such as catalyst loading for each electrode, degree of ion exchange capacity of the polymer electrolyte membrane, and operating current density of the fuel cell.

As evidenced by the specification, paragraph 39 of the corresponding PG Publication US 2002/0155340 A1 states that “Q may be regarded as an indicator of adhesion of the electrode to the polymer electrolyte membrane, and it has been found that with the Q value of 0.09-0.18 C/cm<sup>2</sup>, an excellent polymer electrolyte membrane electrode assembly is obtained”. Paragraph 42 of the specification also states “the Q value is defined as the amount of electric charge per a unit area of the membrane electrode assembly, indicating that the larger the Q value, the higher the adhesion of the electrode 100 to the polymer electrolyte membrane 101.”

The value Q depends on a variety of conditions such as catalyst loading, degree of adhesion of the electrode to the catalyst layer, and the operating current density of the membrane electrode assembly in the fuel cell and it is not a property of the polymer electrolyte membrane. Furthermore, there is no recognition in the art using the value Q as defined by applicant to characterize the polymer electrolyte membrane in a membrane electrode assembly or the membrane electrode assembly. The value Q only exists under a given set of operating conditions not claimed for a fuel cell comprising the membrane electrode assembly.

In claims 10 and 16, the limitation “said polymer electrolyte membrane is made of a sulfonated hydrocarbon polymer that may contain oxygen in its skeleton or other substituent groups than a sulfonic group” is indefinite because it is unclear how a sulfonated hydrocarbon

Art Unit: 1745

polymer may contain other substituents groups than a sulfonic group if the hydrocarbon polymer is sulfonated.

In claims 3 and 8, the limitation "the distance along said interface is longer than said linear distance by 15% or more on average" is indefinite because it is unclear how this average is clearly determined and the distance along the interface may vary depending on how the average is taken. Furthermore, it is unclear how the distance along the interface is determined by any average since there are discrete catalyst particles along the interface and the interface would be discontinuous and it would appear that the average would vary depending on how measurements are made.

Claims depending from claims rejected under 35 USC 112, second paragraph are also rejected for the same.

### ***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Art Unit: 1745

7. Claims 1-4, and 10-12 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Fukuda et al. (US2002/0055034A1).

See paragraphs 7, 17, 23, 25, 41, 64, 70, 79, 99, 116; Tables 1-3; and Figures 1, 2, 4-7, 9, 11 of the reference.

8. As best understood, claims 5-9, 16 and 17 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Fukuda et al. (US2002/0055034A1).

See paragraphs 7, 17, 23, 25, 41, 64, 70, 79, 99, 116; Tables 1-3; and Figures 1, 2, 4-7, 9, 11 of the reference.

9. Claims 1-4, 10 and 12 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Swathirajan et al. (US Pat. No. 5,272,017).

See Abstract; Figure 2; col. 2, lines 3-30; col. 4, lines 42-50; col. 7, lines 30-42 of the reference.

10. Claims 1-4, 10, and 12 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Spiwak et al. (US Pat.No. 6,136,412).

See col. 2, lines 57-67; col. 3, lines 30-61; col. 7, lines 20-30; col. 8, lines 4-35; col. 15, lines 49-55; col. 16, lines 23-26; col. 20, lines 48-61; col. 21, lines 42-54 of the reference.



Art Unit: 1745

***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swathirajan et al. (US Pat. No. 5,272,017) in view of Yen et al. (US Pat. No. 5,795,496).

Swathirajan et al. (US Pat. No. 5,272,017) disclose all the limitations of claim 11 above except that the sulfonated hydrocarbon polymer is sulfonated polyetheretherketone. Swathirajan et al. do disclose NAFION as the ion exchange resin in the membrane (col. 4, lines 42-50).

Yen et al. teach that sulfonated polyetheretherketone is stable at higher temperatures of operation of the membrane electrode assembly in a fuel cell compared to NAFION and that the sulfonated polyetheretherketone has low methanol permeability, high proton conductivity, and is inexpensive and readily available (col. 2, lines 19-28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use sulfonated polyetheretherketone as the ion exchange resin membrane in the membrane electrode assembly (MEA) of Swathirajan et al. because sulfonated polyetheretherketone is stable at high temperatures of operation of the membrane electrode assembly in a fuel cell when compared to NAFION and that the sulfonated polyetheretherketone has low methanol permeability, high proton conductivity and is inexpensive and readily available.

Art Unit: 1745

13. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Spiewak et al. (US Pat.No. 6,136,412) in view of Yen et al. (US Pat. No. 5,795,496).

Spiewak et al. (US Pat.No. 6,136,412) disclose all the limitations of claim 11 above except that the sulfonated hydrocarbon polymer is sulfonated polyetheretherketone. Spiewak et al. do disclose the use of sulfonated hydrocarbon polymer as the ion -exchange resin the membrane of the membrane electrode assembly and NAFION (col. 16, lines 23-26).

Yen et al. teach that sulfonated polyetheretherketone is stable at higher temperatures of operation of the membrane electrode assembly in a fuel cell compared to NAFION and that the sulfonated polyetheretherketone has low methanol permeability, high proton conductivity, and is inexpensive and readily available (col. 2, lines 19-28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use sulfonated polyetheretherketone as the ion exchange resin membrane in the membrane electrode assembly (MEA) of Spiewak et al. because sulfonated polyetheretherketone is stable at high temperatures of operation of the membrane electrode assembly in a fuel cell when compared to NAFION and that the sulfonated polyetheretherketone has low methanol permeability, high proton conductivity and is inexpensive and readily available.

#### ***Double Patenting***

14. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686

Art Unit: 1745

F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

15. Claim 1 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of copending Application No.

09/942,123. Although the conflicting claims are not identical, they are not patentably distinct from each other because claim 1 of the copending application 09/942,123 (now US 2002/0055034 A1) recites a membrane electrode assembly composed of a pair of electrode catalyst layers and an electrolyte membrane sandwiched between the electrode catalyst layers which is configured so that the catalyst of at least one surface of the electrode catalyst layers enter in the electrolyte membrane whereby the electrode catalyst layer and the electrolyte membrane are unified with each other which reads on and anticipates instant claim 1 of the present application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

### ***Conclusion***

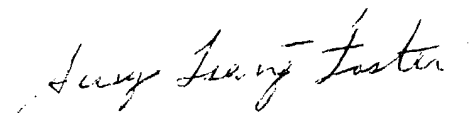
16. Any inquiry concerning this communication or earlier communications should be directed to examiner Susy Tsang-Foster, Ph.D. whose telephone number is (571) 272-1293. The examiner can normally be reached on Monday through Friday from 9:30 AM to 6:00 PM.

Art Unit: 1745

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at (571) 272-1292.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

st/

A handwritten signature in cursive script, reading "Susy Tsang-Foster".

Susy Tsang-Foster  
Primary Examiner  
Art Unit 1745